

Understand the concept of a function and use function notation.

1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.

Secondary Math I	Secondary Math II	Secondary Math III
Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of function at this stage is not advised. Students should apply these concepts throughout their future mathematics courses.	Continues throughout high school mathematics.	Continues throughout high school mathematics.

2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Secondary Math I	Secondary Math II	Secondary Math III
Draw examples from linear and exponential functions. In F.IF.3, draw connection to F.BF.2, which requires students to write arithmetic and geometric sequences. Emphasize arithmetic and geometric sequences as examples of linear and exponential functions.	Continues throughout high school mathematics.	Continues throughout high school mathematics.

3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.

Secondary Math I	Secondary Math II	Secondary Math III
Draw examples from linear and exponential functions. In F.IF.3, draw connection to F.BF.2, which requires students to write arithmetic and geometric sequences. Emphasize arithmetic and geometric sequences as examples of linear and exponential functions.		

Interpret functions that arise in applications in terms of the context.

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* ★

Secondary Math I	Secondary Math II	Secondary Math III
For F.IF.4, focus on linear and exponential functions.	For F.IF.4, focus on quadratic functions; compare with linear and exponential functions studied in Math I.	Emphasize the selection of a model function based on behavior of data and context while working on F.IF.4.

5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.

Secondary Math I	Secondary Math II	Secondary Math III
For F.IF.5, focus on linear and exponential functions.	For F.IF.5, focus on quadratic functions; compare with linear and exponential functions studied in Math I.	Emphasize the selection of a model function based on behavior of data and context while working on F.IF.5.

6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Secondary Math I	Secondary Math II	Secondary Math III
For F.IF.6, focus on linear functions and intervals for exponential functions whose domain is a subset of the integers. Secondary Mathematics II and III will address other function types.	For F.IF.6, focus on quadratic functions and intervals for exponential functions whose domain is all real numbers. Secondary Mathematics III will address other function types.	Emphasize the selection of a model function based on behavior of data and context while working on F.IF.6..

Analyze functions using different representations.

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

Secondary Math I	Secondary Math II	Secondary Math III
For F.IF.7a, focus on linear functions. Include comparisons of two functions presented algebraically. For example, compare the growth of two linear functions.	For F.IF.7a, focus on quadratic functions. Extend work on quadratics to include the relationship between coefficients and roots.	

- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

Secondary Math I	Secondary Math II	Secondary Math III
	For F.IF.7b, compare and contrast absolute value and piecewise-defined functions with linear, quadratic, and exponential functions. Highlight issues of domain, range and usefulness when examining piecewise-defined functions.	For F.IF.7b, compare and contrast square root, cube root, absolute value, step and piecewise-defined functions with all functions. Highlight issues of domain, range and usefulness when examining piecewise-defined functions.

- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

Secondary Math I	Secondary Math II	Secondary Math III
		For F.IF.7c, relate polynomial functions in general to the relationship between zeros of quadratic functions and their factored forms.

- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. (HONORS STANDARD)

Secondary Math I	Secondary Math II	Secondary Math III HONORS
		Focus on entire standard.

- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

Secondary Math I	Secondary Math II	Secondary Math III
For F.IF.7e, focus on exponential functions. Include comparisons of two functions presented algebraically. For example, compare two exponential functions such as $y=3^n$ and $y=100 \cdot 2^n$.		Focus on entire standard.

- f. Draw a curve parametrically and draw its graph.

Secondary Math I	Secondary Math II	Secondary Math III HONORS
		Focus on entire standard.